

**REMARKS**

Claims 1-7 remain pending. Claims 8-22 are cancelled without prejudice to prosecution in a divisional application. Claims 1, 6, and 7 are independent. Claims 1, 4, 6, and 7 have been amended. Reconsideration of the pending claims is respectfully requested.

In the Office Action, claims 6 and 7 were objected to as allowable but dependent from a rejected base claim. In response, claims 6 and 7 have been rewritten in independent form including the limitations of the base claim and all intervening claims.

In the Office Action, claims 1-4 were rejected as anticipated by Pretzer. Applicant respectfully traverses that rejection. The office action states, “*...it would be readily apparent to those of ordinary skill in the art that the thiol would complex with cobalt to form complexes with the broad view of Claim 1 because of the available empty orbitals of cobalt and the strongly electron-donative nature of the thiol.*” Thus, it appears that the Examiner believes that the formation of the cobalt thiol complex is inherent in Pretzer, i.e. that it necessarily follows that the complex must form.

Applicant respectfully disagrees. The formation of a cobalt-thiol complex is not inherent in the disclosure of Pretzer, nor would it be obvious to those skilled in the art. Empty d-orbitals abound among metals, yet we don’t see them forming complexes with every possible ligand. Thiols are not *strongly electron donative*, but have at most a mediocre or even weak electron donating nature, as shown by their disadvantaged position

in the electrochemical series. Pretzer does not disclose any complex formation. Nor would such complex formation be readily apparent.

In order for a complex species to form, there are compatibility requirements to link a central cation and any given ligands. **The requirements are those dealing with energy levels and molecular orbital symmetry.** An energy level mismatch will force overlapping electrons into non bonding or even antibonding situations, and on the other hand lack of molecular orbital symmetry produces no overlaps at all.

There are many instances where one finds cations with plenty of available d-orbitals, and likewise, ligands with real electron donating nature are also plenty. However, that is not sufficient to ensure that complexes will form. For example, if we look at the formation of aqueous complexes, the species  $[\text{Co}(\text{NH}_3)_6]^{2+}$  is well known and fully characterized, whereas the species  $[\text{Cr}(\text{NH}_3)_6]^{2+}$  can't be formed under the same circumstances. Yet in both cases we have a divalent cation of a 3d element, and interestingly,  $\text{NH}_3$  is indeed a strong ligand, holding a favorable position in the electrochemical series. Another example to illustrate the non-obviousness of complex formation is found in some transition metal peroxides. We can find peroxy ( $\text{O}_2^{2-}$ ) complexes of  $\text{Ti}^{\text{IV}}$ ,  $\text{V}^{\text{V}}$ , and  $\text{Cr}^{\text{VI}}$ , yet we can't find peroxy complexes formed with the rest of the 3d elements, even though every cation left in that series of transition metals ( $\text{Co}^{2+}$  included) does have 3d orbitals quite available for complex formation, and they do form complexes with many other ligands. Sulfur ligands, these are considered "soft" in nature, while  $\text{Co}^{2+}$  possesses borderline hardness, so it would be unlikely that anyone skilled in this art could have any assur-

ance that a complex would be formed without using the analytical techniques we have applied.

Applicants understood the existence of a complex species having a structure  $[M(RSH)_n]^{2+}$  (in a simple case where there are no other ligands, and  $y = 0$  for  $L_y$ ). Pretzer et al. did disclose such a complex.

Claims 1-5 were rejected as obvious over Mackenzie. Applicant respectfully traverses this rejection.

Mackenzie is unrelated art. In Mackenzie, the amine bidentate is an essential ligand, whereas in the invention as claimed, ligands are not required. Specifically, if  $y$  is zero, there are no other ligands. The catalyst system with the complex  $[M(RSH)_n]^n$ , as indicated in claim 1, 6, and 7 is not shown, nor obvious from the disclosure of Mackenzie.

Reconsideration of the above claims in view of the foregoing remarks is requested. Applicant's attorney respectfully requests that the Examiner contact the undersigned if there is any reason this case can not be allowed and passed to issue.

